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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Paper No. 01/15/2004

Application Number: 09/828,635
Filing Date: April 5, 2001
Appellant(s): SIN ET AL.

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Mark Lauer
For Appellants

EXAMINER'S ANSWER

This is in response to the appeal brief filed December 11, 2003.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellants' statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellants' statement of the issues in the brief is substantially correct. The changes are as follows: the claims in issue 4 are rejected as being obvious over U.S. Patent No. 5,991,125 to Iwasaki et al. in view of U.S. Patent No. 6,496,338 to

Hasegawa et al. and U.S. Patent No. 6,396,734 to Ishikawa et al. (not U.S. Patent No. 5,995,338 to Watanabe as in issue 5); and in issue 7, claims 5 and 13 are rejected as unpatentable over the listed references not claims 5 and 12.

(7) Grouping of Claims

The appellants' statement in the brief that certain claims do not stand or fall together is not agreed with because appellants have not provided any reasoning or arguments as to why the individual claims stand or fall separately, as required by 37 CFR 1.192(c)(7) and (c)(8). Therefore, the Examiner has interpreted that within each grouping of claims, the claims in the group stand or fall together.

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

5,910,868	***KUROSAWA ET AL.***	***6-1999***
6,496,338	***HASEGAWA ET AL.***	***12-2002***
5,991,125	***IWASAKI ET AL.***	***11-1999***
6,396,734	***ISHIKAWA ET AL.***	***5-2002***
5,995,338	***WATANABE ET AL.***	***11-1999***
6,122,151	***SAITO ET AL.***	***9-2000***

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 6, 7 and 17 – 20 stand rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. These claims contain reference to a third non-magnetic layer and/or a fourth ferromagnetic layer in specific structural locations, yet the as-filed specification and Figures fail to describe a third non-magnetic layer and fourth ferromagnetic layer meeting the claimed structural limitations.

Claims 17 – 20 stand rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which

appellants regard as the invention. Claims 17 – 20 are incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: the relative locations of the ferromagnetic layers, ferromagnetic "portions", and the non-magnetic layers, since the terms "distal" and "first and second ferromagnetic layers" in the claims are vague and indefinite when considered in view of the as-filed disclosure.

The claims are also indefinite in that they recite "first and second ferromagnetic layers that are disposed essentially in a plane" and the specification defines these layers as specific layers in Figures 3 and 6 that are not "disposed essentially in a plane" (*i.e. layers 104 and 018 in Figure 3 and layers 206 and 210 in Figure 6 – see Paragraphs 0016, 0018, 0029 and 0030*). Since the specification does not use or define the terms "defined in a plane" and "distal" with respect to the disclosed invention, it is unclear to the Examiner whether appellants are attempting to claim a structure shown in the Figures or whether the language itself is indefinite. Therefore, claims 17 – 20 are deemed indefinite because the Examiner is unable to ascertain the full scope of the claimed language in view of the as-filed disclosure and/or the as-filed Figures

Claims 1 – 5, 10 – 14 and 16 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasaki et al. (U.S. Patent No. 5,991,125) in view of Hasegawa et al. (U.S. Patent No. 6,496,338 B2).

Regarding claims 1 – 3, 11 and 14, Iwasaki et al. disclose a sensor comprising: first ferromagnetic pinned layer (*Figure 21, element 16*), a second ferromagnetic free layer(*element 11*) and third ferromagnetic bias layer (*element 13*) that are interleaved with first (*element 5*) and second (*element 12*) electrically conductive nonmagnetic spacer layers (col. 10, lines 27 – 44 and lines 55 - 60), said first nonmagnetic layer adjoining said first and second ferromagnetic layers (*elements 14/5/11*), said second nonmagnetic layer adjoining said second and third ferromagnetic layers (*elements 11/12/13*), said first and third ferromagnetic layers having magnetic moments with directions that are fixed in response to an applied magnetic field (*i.e. are "pinned" magnetic layers – see Figure 21 and col. 15, line 61 bridging col. 16, line 4*), said second ferromagnetic layer having a free portion, said free portion having a magnetic moment with a direction that rotates in response to said applied magnetic field (*i.e. is a "free" magnetic layer – see Figure 21 col. 10, lines 27 - 44*). The Examiner notes that the disclosed AFM layer (*element 14*) is a "pinning structure" adjoining said pinned layer and adapted to fix a magnetic moment of said pinned layer in a first direction as defined by appellants' claim 12 (*see rejections of claims 4, 5, 12 and 13 below*).

Iwasaki et al. fail to disclose the third ferromagnetic layer overlapping only a portion of the second magnetic layer.

However, Hasegawa et al. teach forming a sensor wherein the biasing elements (*Figure 1, element 35*) only cover an exterior of the free magnetic layer (*element 34*) in order to suppress Barkhausen noise and to pin only part of the free magnetic layer by exchange coupling (*col. 1, line 56 bridging col. 2, line 47 and Figures 2 and 10*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the appellants' invention to modify the device of Iwasaki et al. to form the layers above the free magnetic layer (*Iwasaki et al. - element 11*) such that they are only over the outer portion of the free magnetic layer as taught by Hasegawa et al. in order to pin the exterior part of the free magnetic layer via exchange coupling, thereby suppressing Barkhausen noise generation.

Regarding the limitations in the magnetization of the second ferromagnetic layer (claims 1 and 14), the disclosed prior art product as taught by Iwasaki et al. in view of Hasegawa et al. is substantially identical in structure to the claimed product (i.e. a spin valve sensor comprising a pinned magnetic layer, a free magnetic layer and another pinned magnetic layer broken into sections only extending over part of the free magnetic layer – See appellants' Figure 3).

Therefore, in addition to the above disclosed limitations, the presently claimed properties of:

> the second ferromagnetic layer having a fixed portion, said fixed portion having a magnetic moment with a direction that does not rotate in response to said applied magnetic field (*i.e. the definition of "pinning" and equivalent to claim 14 – "a magnetically stabilized portion"*) and wherein said third ferromagnetic layer overlaps said fixed portion and does not overlap said free portion
>
> would appear to be met by the above described structure.

Regarding claims 4, 5, 12 and 13, Iwasaki et al. disclose antiferromagnetic layers meeting appellants' claimed limitations (*Figure 21, elements 14; col. 10, lines 36 – 38;*

and col. 15, line 42 bridging col. 16, line 6, which teaches that the NiFe and CoFe layers result in different blocking temperatures for the antiferromagnetic layers).

Regarding claims 10 and 16, Iwasaki et al. disclose the equivalents of using a structure where the first and third ferromagnetic layers have magnetic moments meeting appellants' claimed limitations (*Figure 14B compared to Figures 21 and 22*). Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. In the instant case, first and third ferromagnetic layers having perpendicular magnetic moments or opposite magnetic moments are equivalents in the field of multi-layered spin-valve sensors. *In re Fount* 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *Graver Tank & Mfg. Co. Inc. v. Linde Air Products* Co. 85 USPQ 328 (USSC 1950).

Claims 6, 7 and 9 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasaki et al. in view of Hasegawa et al. as applied above, and further in view of Ishikawa et al. (U.S. Patent No. 6,396,734 B2).

Iwasaki et al. and Hasegawa et al. are relied upon as described above.

Neither Iwasaki et al. nor Hasegawa et al. disclose a fourth ferromagnetic layer and third nonmagnetic layer meeting appellants' claimed structural limitations.

However, Ishikawa et al. teach that it is old in the art to substitute a single pinned layer with a synthetic pinned ferromagnetic layer comprising an additional ferromagnetic layer and non-magnetic layer inorder to reduce the static magnetic field, thereby remedying the peak asymmetry of the read-back waveform of the head (*col. 3, lines 9 –*

24). Replacement of the third ferromagnetic pinned layer (*Iwasaki et al., element 13*) with a {third ferromagnetic/ third non-magnetic/ fourth ferromagnetic} synthetic pinned layer would meet appellants' claimed structural limitations of a third non-magnetic layer adjoining said third and fourth ferromagnetic layers.

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the appellants' invention to modify the device of Iwasaki et al. in view of Hasegawa et al. to utilize a synthetic pinned magnetic layer as taught by Ishikawa et al. in order to reduce the static magnetic field, thereby remedying the peak asymmetry of the read-back waveform of the head.

Claims 8 and 15 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasaki et al. in view of Hasegawa et al. as applied above, and further in view of Watanabe et al. (U.S. Patent No. 5,995,338).

Iwasaki et al. and Hasegawa et al. are relied upon as described above.

Neither Iwasaki et al. nor Hasegawa et al. disclose a non-magnetic layer meeting appellants' claimed composition limitation.

However, the ruthenium (Ru), iridium (Ir) and rhodium (Rh) are known equivalents to Cu (used by Iwasaki et al.), as taught by Watanabe et al. (*col. 8, lines 33 – 37*).

Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. In the instant case, Cu, Ru, Rh and Ir are equivalents in the field of nonmagnetic conductive elements for nonmagnetic conductive layers in

sensors. *In re Fount* 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *Graver Tank & Mfg. Co. Inc. v. Linde Air Products Co.* 85 USPQ 328 (USSC 1950).

Claims 1 – 4 and 10 – 12, 14 and 16 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. (U.S. Patent No. 6,122,151) in view of Watanabe et al. (U.S. Patent No. 5,995,338) and Kurosawa et al. (U.S. Patent No. 5,910,868).

Regarding claims 1 – 3, 11 and 14, Saito et al. disclose a sensor comprising: first ferromagnetic pinned layer (*Figure 3, element 2*), second ferromagnetic free layer (*element 4*) and third ferromagnetic bias layers (*element 10*) that are interleaved with first (*element 3*) electrically conductive nonmagnetic layer (col. 6, lines 15 - 18), said first nonmagnetic layer adjoining said first and second ferromagnetic layers (*elements 2/3/4*), wherein said third ferromagnetic layer overlaps only a portion of said second ferromagnetic layer. The Examiner notes that the disclosed AFM layer (*element 1*) is a "pinning structure" adjoining said pinned layer and adapted to fix a magnetic moment of said pinned layer in a first direction as defined by appellants' claim 12 (*see rejections of claims 4 and 12 below*).

Regarding the limitations in the magnetization of the second ferromagnetic layer, the disclosed prior art product as taught by Saito et al. is substantially identical in structure to the claimed product, i.e. a spin valve sensor comprising a lower antiferromagnetic pinning structure (*element 1*), a pinned magnetic layer, a free magnetic layer, a second pinned magnetic layer and a biasing layer (*element 5*) pinning

the second magnetic layer, wherein the second pinned magnetic layer is broken into sections only extending over part of the free magnetic layer (see appellants' Figure 3). The Examiner notes that the hard magnetic "bias layers" of Saito et al. (*element 5*) are known equivalents to antiferromagnetic bias layers as used by appellants. See Watanabe et al. ('338) for support that these materials are known equivalents for bias layers (*col. 9, lines 54 - 55 and col. 18, lines 20 – 27: "the same effect can be obtained when ... an antiferromagnetic thin film having a body-centered cubic lattice structure is used"*).

While Saito et al. is silent with regard to the following limitations of::

said first and third ferromagnetic layers having magnetic moments with directions that are fixed in response to an applied magnetic field (*i.e. are "pinned" magnetic layers –col. 4, line 64 bridging col. 5, line 24*), said second ferromagnetic layer having a fixed portion and a free portion, said free portion having a magnetic moment with a direction that rotates in response to said applied magnetic field (*i.e. is a "free" magnetic layer –col. 8, line 60 bridging col. 9, line 39*), said fixed portion having a magnetic moment with a direction that does not rotate in response to said applied magnetic field (*i.e. the definition of "pinning" and equivalent to claim 14 – "a magnetically stabilized portion"*) and wherein said third ferromagnetic layer overlaps said fixed portion and does not overlap said free portion

such would appear to result from the above described structure (*see also col. 9, lines 11 - 22, teaching a free magnetic layer having three separate magnetization regions, depending on where the third ferromagnetic layer is formed*).

Neither Saito et al. nor Watanabe et al. disclose a second nonmagnetic layer meeting appellants' claimed structural limitations (i.e. interleaved between the second and third ferromagnetic layers).

However, Kurosawa et al. teach forming a sensor where a nonmagnetic layer is inserted directly below a ferromagnetic/antiferromagnetic layer structure (*i.e. Saito et al., elements 10 and 5*) in order to improve the exchange coupling field (Hua) of the antiferromagnetic layer (*col. 3, lines 3 – 13 and lines 63 – 65*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the appellants' invention to modify the device of Saito et al. in view of Watanabe et al. to form a second non-magnetic layer between the second and third ferromagnetic layers in order to improve the Hua of an antiferromagnetic bias layer deposited on the third ferromagnetic layer.

Regarding claims 4 and 12, Saito et al. disclose antiferromagnetic layers meeting appellants' claimed limitations (*col. 5, lines 65 – 67 and Figure 3, element 1*).

Regarding claims 10 and 16, Saito et al. disclose ferromagnetic layers having magnetization states meeting appellants' claimed limitations (col. 5, lines 1 – 8).

Claims 5 and 13 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. in view of Kurosawa et al. and Watanabe et al. as applied above, and further in view of Hasegawa et al. (U.S. Patent No. 6,496,338).

Saito et al., Kurosawa et al. and Watanabe et al. are relied upon as described above.

None of the above teach antiferromagnetic layers meeting appellants' claimed blocking temperature limitations.

However, Hasegawa et al. teach a spin valve sensor comprising an upper and lower antiferromagnetic layer wherein the two layers are taught to be unique from each other in composition (iron oxide versus X-Mn alloy), and hence necessarily blocking temperatures (*see Figure 8, showing a* T_{block} *of ~320 °C for* α*-*Fe_2O_3), in order to produce a sensor having excellent corrosion resistance, linear response and requiring no special heat treating equipment (*col. 5, lines 50 – 67; col. 7, lines 3 – 53; col. 9, lines 31 – 34; and Figure 1, elements 31 and 35*).

The Examiners sound basis for the position that the blocking temperatures would necessarily be different between the disclosed antiferromagnetic oxide and antiferromagnetic X-Mn alloys is based on the disclosure of Hasegawa et al. which provides at least one specific example wherein the blocking temperatures are shown to be different (*Table 1 – where FeMn is shown to have a blocking temperature of 150 °C in Figure 8 versus a value of ~320 °C for* α-Fe_2O_3). Given that it would be unexpected that two distinct materials (an antiferromagnetic oxide and an X-Mn alloy) would possess identical blocking temperatures, the Examiner deems that one of ordinary skill

in the art would readily recognize that Hasegawa et al. was implicitly teaching the use of two antiferromagnetic materials possessing different blocking temperatures since Hasegawa et al. never states that the blocking temperatures of the X-Mn alloys should be tailored to equal 320 °C (the blocking temperature of the antiferromagnetic iron oxide).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the appellants' invention to modify the device of Saito et al. in view of Kurosawa et al. and Watanabe et al. to use antiferromagnetic layers meeting appellants' claimed limitations as taught by Hasegawa et al. in order to produce a sensor having excellent corrosion resistance, linear response and requiring no special heat treating equipment.

Claims 6, 7 and 9 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al. in view of Kurosawa et al. and Watanabe et al. as applied above, and further in view of Ishikawa et al. (U.S. Patent No. 6,396,734).

Saito et al., Kurosawa et al. and Watanabe et al. are relied upon as described above.

None of the above disclose a fourth ferromagnetic layer and third nonmagnetic layer.

However, Ishikawa et al. teach that it is known in the art to substitute a single pinned layer with a synthetic pinned ferromagnetic layer comprising an additional ferromagnetic layer and non-magnetic layer inorder to reduce the static magnetic field, thereby remedying the peak asymmetry of the read-back waveform of the head (*col. 3,*

lines 9 – 24). Replacement of the third ferromagnetic layer (*Saito et al., element 10*) with a {third ferromagnetic/ third non-magnetic/ fourth ferromagnetic} synthetic pinned layer would meet appellants' claimed structural limitations of a third non-magnetic layer adjoining said third and fourth ferromagnetic layers.

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the appellants' invention to modify the device of Saito et al. in view of Kurosawa et al. and Watanabe et al. to utilize a synthetic pinned magnetic layer as taught by Ishikawa et al. in order to reduce the static magnetic field, thereby remedying the peak asymmetry of the read-back waveform of the head.

(11) Response to Argument

(i) Whether claims 6, 7 and 17-20 are adequately enabled under 35 U.S.C. 112, 1st Paragraph

Appellants argue claims 6, 7 and 17 – 20 are adequately enabled, reciting the structure disclosed in Figure 3 for support of the disclosed first, second, third and fourth ferromagnetic layers and the first, second and third "nonferromagnetic layers". The Examiner respectfully disagrees.

First, the Examiner notes that appellants refer to the antiferromagnetic layer in Figure 3 (layer 102) as a "nonferromagnetic layer" (*Brief, page 4*), which is repugnant to the definition one of ordinary skill in the art would give to "nonferromagnetic". Nonferromagnetic is equivalent language to "nonmagnetic" and appellants have not

defined "nonferromagnetic" to mean anything other than the common meaning that one of ordinary skill in the magnetic head art would normally utilize. See for example Hasegawa et al. (*col. 9, lines 56 – 62 and Table 1*).

Second, even assuming appellants have adequately defined nonferromagnetic to encompass antiferromagnetic layers, the Examiner notes that layer 102 cannot be the "first nonferromagnetic layer" since claim 1 requires "first, second and third ferromagnetic layers that are interleaved with first and second nonferromagnetic layers, said first nonferromagnetic layer adjoining said first and second ferromagnetic layers ...". If, as appellants argue that layer 104 is the "first ferromagnetic layer" and 108 is the "second ferromagnetic layer", the only layer that is "adjoining said first and second ferromagnetic layer" is layer 106. The Examiner can think of no better support for the lack of enablement than if appellants themselves are unable to ascertain the claimed structure from the as-filed disclosure and Figures.

(ii) Whether claims 17 – 20 are indefinite under 35 U.S.C. 112, 2nd Paragraph

Appellants argue that the claims as written are clear when interpreted in view of Figure 3, since the first, second, third and fourth ferromagnetic layers and the first and second portions of the third ferromagnetic layer can easily be ascertained. The Examiner respectfully disagrees.

The Examiner notes that the language of claim 17 refers to "first and second ferromagnetic layers that are disposed substantially in a plane" combined with a third magnetic layer possessing a third portion "distal to said first and second ferromagnetic

layers", as well as a nonferromagnetic, electrically conductive layer "adjoining said third ferromagnetic layer distal to said first and second ferromagnetic layer" and a "fourth ferromagnetic layer adjoining said conductive layer". Appellants turn to Figure 3 for guidance, calling layers 111 and 112 the first and second ferromagnetic layers yet appellants' as-filed disclosure specifically refers to elements 104 and 108 as the "first ferromagnetic layer" and "second ferromagnetic layer" (*Paragraphs 0016 – 0018*).

It is unclear to the Examiner how one of ordinary skill would possess the knowledge that the language of claim 17 would need to be interpreted in view of Figure 3, which contains no nomenclature as to what each layer is, but that the as-filed disclosure describing Figure 3 could not be relied upon when determining which layer is the claimed "first", "second" and other ferromagnetic layers.

(iii) Whether claims 1 – 5, 10 – 14 and 16 are unpatentable under 35 U.S.C. 103(a) as being obvious over Iwasaki et al. ('125) in view of Hasegawa et al. ('338)

Appellants argue that Iwasaki et al. fail to disclose a fixed portion of the second ("free") ferromagnetic layer and that "should the device of Iwasaki et al. be modified as proposed in the Office Action ... it is unlikely that the free magnetic layer would be pinned" (*Appeal Brief, page 8*). Appellants additionally argue that the proposed modification would destroy the Iwasaki et al. invention and would therefore not have been motivated to one of ordinary skill in the art (*Appeal Brief, pages 9 - 11*). The Examiner respectfully disagrees.

As stated in the rejection of record, the Examiner has taken the position that the limitation

> " the second ferromagnetic layer having a fixed portion, said fixed portion having a magnetic moment with a direction that does not rotate in response to said applied magnetic field (*i.e. the definition of "pinning" and equivalent to claim 14 – "a magnetically stabilized portion"*) and wherein said third ferromagnetic layer overlaps said fixed portion and does not overlap said free portion"

would appear to be met from the structure resulting from the combined teachings of Iwasaki et al. and Hasegawa et al., since Hasegawa et al. teach that the biasing layers function by "pinning the rotation of the magnetization at both ends of the ferromagnetic layer" *(col. 9, lines 56 – 62)*.

While appellants argue that the above limitation would not necessarily be met from the recited structure, the Examiner notes that the prior art of record has provided a teaching that pinning only the outer edges of the free magnetic layer is desired and that the distance between separated biasing elements can be used to set the track width in a magnetoresistive (MR) head. Specifically, the prior art is directed to substantially identical subject matter: a magnetoresistive element possessing a free layer with two biasing elements separated from one another by the track width. Hasegawa et al. teach that the biasing elements pin the ends of the adjoining ferromagnetic layer, thereby leaving the center portion free to rotate (i.e. definition of a "free" magnetic layer). As such, the Examiner deems there is sufficient teaching in the prior art that such a

structure would meet appellants' claimed limitations and appellants have provided no *evidence* of record supporting their alleged position.

Appellants further argue that claim 11 is not addressed in the rejection and that the limitation of "a ferromagnetic bias layer exchange coupled to a portion of said free layer by a nonferromagnetic layer" is absent in the Iwasaki et al. invention. The Examiner respectfully disagrees.

The Examiner notes that claim 11 contains substantially identical limitations as claim 1, but instead of the generic language "first", "second" and "third" ferromagnetic layers, appellants have used the nomenclature "pinned" (*i.e. the first*), "free" (*i.e. the second*) and "bias" (*i.e. the third*). The Examiner has addressed this nomenclature change in the rejection of record. The Examiner notes that the ferromagnetic bias layer (*Iwasaki et al., Figure 21 – element 13*) is exchange coupled to a portion of said free layer (*element 11*) by a nonferromagnetic layer (*element 12*).

(iv) Whether claims 6, 7 and 9 are unpatentable under 35 U.S.C. 103(a) as being obvious over Iwasaki et al. ('125) in view of Hasegawa et al. ('338) and Ishikawa et al. ('734)

In addition to the arguments applied above, Appellants argue that should the relied upon modification be performed, "the electrically conductive intermediate layer (12) would not be functional, as discussed above, and so no need would exist for a pinning layer (13)". The Examiner respectfully disagrees.

The Examiner acknowledges appellants arguments that the alleged modification would either not work or not require a "pinning layer", but appellants have provided no evidence of record supporting the alleged position. As such, since the prior art teaches and recognizes comparable structures as pinned magnetic layers. The Examiner deems there is sound basis for the position that such a structure would work absent evidence to the contrary.

(v) Whether claims 8 and 15 are unpatentable under 35 U.S.C. 103(a) as being obvious over Iwasaki et al. ('125) in view of Hasegawa et al. ('338) and Watanabe et al. ('338)

In addition to the arguments applied above, Appellants argue that the adjacent ruthenium, iridium or rhodium layer would not pin the second ferromagnetic layer (i.e. "have a fixed part"). The Examiner respectfully disagrees.

The Examiner notes that Watanabe et al. contains an explicit statement that "as the aforementioned non-magnetic conductive film, it is preferable to use Au, Ag, Cu; otherwise, Cr, Pt, Pd, Ru, Rh etc., or their alloys may be used". While other factors may influence the pinning (such as layer thickness), the Examiner notes that Hasegawa et al. has provided motivation to pin the exterior portions of the second ferromagnetic layer as recited in the rejection of record.

(vi) Whether claims 1 – 4, 10 – 12, 14 and 16 are unpatentable under 35 U.S.C. 103(a) as being obvious over Saito et al. ('151) in view of Kurosawa et al. ('868) and Watanabe et al. ('338)

Appellants argue that since Saito et al. alone does not disclose a "second nonferromagnetic layer" that Saito et al. is not substantially identical to the claimed invention and therefore cannot possess the claimed properties. The Examiner respectfully disagrees.

As stated in the rejection of record, the property of the second ferromagnetic layer being fixed in a portion necessarily flows from the resulting structure of the prior art. If there are no layers located above the free magnetic layer in Saito et al., then the center portion of the free magnetic layer (*appellants' second ferromagnetic layer*) would necessarily be un-pinned while the exterior portions would remain pinned by the biasing elements.

Appellants further argue that Kurosawa et al. is not a spin-valve sensor and that "a Ta layer would have a much higher resistance than a nonmagnetic, electrically conductive spacer used in a spin valve sensor, and so would not have been employed in the sensor of Saito et al., because a resistive Ta layer would lower the sensitivity of the sensor". The Examiner respectfully disagrees.

The Examiner acknowledges that Ta possesses a higher resistance than Cu and other materials typically used as the "nonmagnetic, electrically conductive spacer layer" in a spin valve sensor. However, the Examiner notes that appellants' argument is moot since it is *not* the spacer layer which is being changed in the Saito et al. invention (*Saito*

et al. layer 3 in Figure 3 is the aforementioned spacer layer). Instead, the motivation is to place a nonferromagnetic seed layer under the biasing structure (*elements 10 and 5*) to promote the growth of a biasing structure possessing improved exchange coupling field (Hua) strength.

Appellants further argue that claim 11 is not addressed in the rejection and that the limitation of "a ferromagnetic bias layer exchange coupled to a portion of said free layer by a nonferromagnetic layer" is absent in the Saito et al. invention. The Examiner respectfully disagrees.

The Examiner notes that claim 11 contains substantially identical limitations as claim 1, but instead of the generic language "first", "second" and "third" ferromagnetic layers, appellants have used the nomenclature "pinned" (*i.e. the first*), "free" (*i.e. the second*) and "bias" (*i.e. the third*). The Examiner has addressed this nomenclature change in the rejection of record. The Examiner notes that the ferromagnetic bias layer (*Saito et al., Figure 3 – element 10*) is exchange coupled to a portion of said free layer (*element 4*) by a nonferromagnetic layer (*Ta layer motivated by Kurosawa et al.*).

(vii) Whether claims 5 and 13 are unpatentable under 35 U.S.C. 103(a) as being obvious over Saito et al. ('151) in view of Kurosawa et al. ('868), Watanabe et al. ('338) and Hasegawa et al. ('338)

In addition to the arguments applied above, Appellants argue that the rejection of claims 5 and 13 was not an obvious typographical error and that the Final Rejection mailed May 27, 2003 was improper. The Examiner respectfully disagrees.

The Examiner notes that the Office Action in question contained the Examiner's contact information and any possible confusion or concern regarding which claims were actually rejected could have been easily clarified prior to this stage in the prosecution. However, appellants are reminded that the proper procedure if appellants feel a case has been improperly made final is to petition the office for removal of the finality of the Office action in question. Whether a case has been made prematurely final is not an appealable issue. See MPEP 706.07(c).

706.07(c) Final Rejection, Premature

Any question as to prematureness of a final rejection should be raised, if at all, while the application is still pending before the primary examiner. This is purely a question of practice, wholly distinct from the tenability of the rejection. It may therefore not be advanced as a ground for appeal, or made the basis of complaint before the Board of Patent Appeals and Interferences. It is reviewable by petition under 37 CFR 1.181. See MPEP § 1002.02(c).

Appellants further argue that "note that different antiferromagnetic layer compositions do not necessarily have different blocking temperatures. This alone negates the obviousness rejection". The Examiner respectfully disagrees.

The Examiner acknowledges that the blocking temperature is a function of both the materials and the composition, but notes that Hasegawa et al. provides explicit teaching that the materials of the two antiferromagnetic layers are different and never teaches or suggests the non-obvious modification that the blocking temperatures of two unique alloys (α-Fe_2O_3 and an X-Mn alloy) be tailored to be identical. Furthermore, note that Hasegawa et al. provides at least one specific example wherein the blocking temperatures are known to be different (*Table 1 – where FeMn is shown to have* a *blocking temperature of 150 °C in Figure 8 versus* a *value of ~320 °C for* α-Fe_2O_3).

Given that it would be unexpected that two distinct materials (an antiferromagnetic oxide and an X-Mn alloy) would possess identical blocking temperatures, the Examiner deems that one of ordinary skill in the art would readily recognize that Hasegawa et al. was implicitly teaching the use of two antiferromagnetic materials possessing different blocking temperatures since Hasegawa et al. does not state that the blocking temperatures of the X-Mn alloys should be tailored to equal 320 °C.

(vii) Whether claims 6, 7 and 9 are unpatentable under 35 U.S.C. 103(a) as being obvious over Saito et al. ('151) in view of Kurosawa et al. ('868), Watanabe et al. ('338) and Ishikawa et al. ('734)

In addition to the arguments applied above, Appellants argue that the proposed modification would not have been attempted by one of ordinary skill in the art since the resulting sensor would function poorly. The Examiner respectfully disagrees.

The Examiner acknowledges appellants arguments that the alleged modification would either not work or possess a decreased sensitivity, but appellants have provided no e*videnc*e of record supporting the alleged position. As such, since the prior art teaches and recognizes comparable structures as pinned magnetic layers and the Examiner deems there is sound basis for the position that such a structure would work absent evidence to the contrary.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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